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John K. Hill*

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*Senior Economist and Policy Advisor, Federal Reserve Bank of Dallas. The views expressed in this article are solely those of the author and should not be attributed to the Federal Reserve Bank of Dallas or to the Federal Reserve System.

DEMOGRAPHICS AND THE FOREIGN INDEBTEDNESS OF THE UNITED STATES

The net foreign investment position of the United States deteriorated sharply during the 1980s. According to Commerce Department estimates, U.S. net foreign assets (which include stocks, bonds, and direct ownership of land and physical capital) fell from an average of 4 percent of GNP during the 1970s to -11 percent of GNP by 1988.[1] The United States had been a debtor country throughout the 19th century, as foreign investors were lured by the vast undeveloped natural resource wealth of the country. What is unusual about the recent indebtedness of the nation is the suddenness with which it occurred and the fact that the traditional circumstances surrounding an investment boom did not appear to be present.

The primary source of the rise in U.S. foreign indebtedness was a massive inflow of foreign capital. The inflow coincided with rapid growth in the U.S. federal budget deficit--hence, the irresistable conclusion that the budget deficit was the primary factor behind the growing foreign indebtedness of the nation. But the importance of the budget deficit is probably overstated by the circumstantial evidence. First, it is likely that some individuals--faced with the prospect of higher future tax liabilities, either for themselves or their children--made provision by saving more out of their income than they otherwise would have. Any private offset to public dissaving would have reduced the need for foreign capital. Second, growth in the federal budget deficit was not the only economic event to affect world capital flows during this period. There were important changes in laws regarding the ownership of foreign assets, especially in Japan. By the mid 1980s, the world capital market was significantly more integrated than it had been in previous

decades.[2] Factors that tended to create an imbalance between national saving and domestic investment could then express themselves in the form of international capital flows rather than international interest rate differentials.

The purpose of this paper is to evaluate the role of demographics in the foreign indebtedness of the United States. Specifically, I wish to determine whether differences between the age mix of the U.S. population and those of other major industrialized countries are in the right direction and are of sufficient magnitude to explain a significant amount of present U.S. foreign indebtedness. Of their own accord, shifts in age distribution are too gradual to produce such a dramatic movement in capital as occurred during the 1980s. But when coupled with a deregulation of markets, international differences in age structure would seem in principle to provide the basis for a large and sudden reallocation of world capital.

My analysis of demographics and U.S. foreign indebtedness is based on simulations of wealth and capital accumulation in the United States and three other major industrialized countries: Japan, West Germany, and the United Kingdom.[3] In the model, households accumulate wealth according to the strict life-cycle theory. They indirectly determine the capital stock through their labor supply decisions. The net foreign asset position of a country is given by the difference between national wealth and the domestic capital stock. Because individual wealth and labor supply vary with age, a nation's net foreign assets vary with the age distribution of its population.

In a counterfactual exercise, I ask what the equilibrium allocation of world capital would have looked like in 1980 had there been a free flow of capital between the major industrialized countries. The calculations indicate

that differences in age mix during this period were sufficient to produce a deficit in U.S. net external assets in an amount equal to 8 percent of GNP. The reason for this result is straightforward. Relative to other major industrialized countries, the United States had a young population. Young households require a large amount of capital to support their labor supply, yet have accumulated only a small amount of wealth. Economies with young populations then have an excess demand for capital and become debtors in the world capital market.

In the paper I also consider what projected changes in age distribution are likely to mean for future capital flows. If the world interest rate is held constant at its 1980 equilibrium value, shifts in the age mix of the U.S. population are significant enough to raise U.S. net capital outflows from -1 percent of GNP during the mid 1980s to over 4 percent of GNP by the year 2009. The results are very much different, however, if interest rates adjust to equalize capital flows within the four countries. Because each country will seek to export capital over most of the next two decades, interest rates must fall to clear the world capital market. The drop in interest rates reduces each country's outflow. The United States, in particular, runs a current account deficit throughout the 1990s and on into the next century.

I. The Model

My analysis of the relationship between demographics and U.S. net foreign assets is based on simulations of aggregate wealth and capital accumulation. The purpose of the simulations is not to replicate or accurately forecast the U.S. net foreign investment position, but to gain a sense of the degree to which it may be influenced by demographics. The model

is extremely simple. There is a single, nonperishable commodity which serves as both a consumption good and a capital good and which all countries produce using a common technology. Households have the same preferences for consumption over time, and they have identical patterns of labor supply. Differences in age distribution provide the only basis for international exchange.

A country's net external assets are calculated as the difference between its national wealth and domestic capital. National wealth is computed by summing individual household wealth. Domestic capital is determined by summing household labor supplies and then deducing the optimal capital stock from a simple model of production.

A. Computing Household Wealth

Households are formed by two adults of age 21. One of the adults lives through the age of 75 and the other through the age of 80. Thus, the maximum planning horizon for any household is 60 years. Households accumulate wealth according to the life-cycle theory. Each household maximizes a utility function of the form

$$U = -\rho^{-1} \sum (1+\delta)^{1-i} N_i (c_i/N_i)^{-\rho}, \tag{1}$$

where δ is a pure rate of time preference, $(1+\rho)^{-1}$ is the elasticity of intertemporal substitution, c_i is household consumption in period i, and N_i is effective family size in period i. The rate of time preference is set equal to .015. In choosing a value for ρ, I follow Robert Hall (1988) who argues that the elasticity of intertemporal substitution is well below one and is probably near zero. I assume that $(1+\rho)^{-1} = .3$.

The time path of effective family size is derived by combining a set of consumption weights with a life-cycle pattern of family size and age composition. The consumption weights are chosen to be consistent with empirical studies of adult equivalence scales.[4] To define family size and age composition, I assume that each household follows the median fertilty pattern of women born in the U.S. baby boom.[5] The household has two children. The first is born when adult members are 27, and the second is born 3 years later. The children remain in the home until they are 21. This fertility pattern is used only to determine household consumption and wealth. The size and age distribution of each country's population are based on actual population data (see section I.D).

The household maximizes utility by choosing a time path of consumption that is financially feasible. Assuming that capital markets are perfect and that the household leaves no bequests, the budget constraint can be written as

$$\Sigma\ (1+r)^{1-i}c_i = (1+r)a_1 + \Sigma\ (1+r)^{1-i}w\ell_i, \tag{2}$$

where r is the real interest rate, w is the real wage rate, ℓ_i is household labor supply in period i, and a_1 is wealth at the beginning of the planning period. Factor prices are determined within the model to clear the world capital market.[6] The time path of household labor supply is defined to reflect age-related variations in both labor-force participation and worker productivity (see section I.B).

An optimal time path of consumption is computed by maximizing (1) subject to (2). Wealth is then built up sequentially as

$$a_{i+1} = a_i + w\ell_i + ra_i - c_i.$$

Figure 1 shows the optimal wealth profile for a given wage and interest rate. The profile is "hump-shaped," reflecting a pattern of accumulation during the working years followed by a drawing down of wealth during retirement. In the simulations, households never assume a negative wealth position. This is not because of any liquidity or borrowing constraint. Rather, given the time path of family needs, it is simply not optimal for the household to incur debt.

The most serious limitation of the life-cycle model is that it overstates the rate at which households draw down their wealth late in life.[7] By overstating the rate of dissaving among the elderly, the model will distort the path of net external assets during periods of significant change in the share of the population accounted for by the elderly. For the United States, there is little movement in this part of the age distribution over the period of analysis. Such is not the case for other OECD countries, especially Japan and West Germany. As I will note later, however, the direction of this bias is clear, and it reinforces the conclusions of the model.

B. Computing Required Capital

Each country produces a single, nondepreciating good using labor and the good itself (capital). The production function takes the Cobb-Douglas form, and it is assumed to be common across countries and constant across time. The optimal capital stock can then be expressed as

$$K = [\alpha/(1-\alpha)](w/r)L,$$

where α is capital's distributive share and L is the aggregate labor supply. In the simulations, α is set equal to .2. When combined with the equilibrium interest rate, this value for α produces a capital/output ratio close to 4.0.

All types of labor are perfect substitutes, but the efficiency of an individuals's labor supply varies with his age. Thus, aggregate labor supply is the sum of the effective labor supplies of individual households. Household labor supply in period i is given by

$$\ell_i = p_i^m g_i^m + p_i^f g_i^f,$$

where p_i^m and p_i^f are the labor-force participation rates of the male and female, and g_i^m and g_i^f are the ratios of male and female earnings to the earnings of an entry-level male worker. The g_i^m are taken from an age-earnings equation estimated by Finis Welch (1979, Table 6, p. S85) for male workers with 1-3 years of college. The term g_i^f is assumed to be independent of age and equal to 1.3.

Labor-force participation varies only with age. The assumed pattern of male labor-force participation is consistent with cross-section data which show that participation for men begins to decline during their fifties and falls off sharply during their middle sixties. The figures on female labor-force participation reflect two things: (1) a basic participation rate of 80 percent for women who are neither in their childbearing years nor nearing retirement [as projected by the Bureau of Labor Statistics (1984) for women born in the late 1940s and early 1950s], and (2) the effect of young children on female labor supply [as estimated by W. Bowen and T.A. Finegan (1969), with an adjustment for greater use of day care].[8]

Because scale in production is of no consequence, each household generates a demand for capital equal to a fixed proportion of its labor supply. And because household labor supply varies over the life cycle, so does the household's capital requirement. Figure 1 shows the relationship

between age and required capital for a given wage and interest rate. The shape of the profile during the first half of the life of the household reflects the effects of gains in the productivity of the male worker and changes in the rate of female labor-force participation during the child-rearing years. Effective household labor supply peaks when adults are in their early forties. At that point, labor supply begins to decline--slowly at first, tracking the decline in worker productivity, and then more rapidily as labor-force participation falls off.

C. A Simple Explanation of How Demographics Affect a Country's Net Foreign Asset Position

By comparing the wealth profile with the capital profile, we get a clear picture of how the age mix of a country's population affects its net external asset position. Young households contribute to an excess demand for capital because the capital required to support their labor supply exceeds their personal wealth. Economies with young populations then become net borrowers in the world market. As households age, their wealth increases and eventually comes to exceed their capital requirements. At that point, they become net suppliers of capital. The aggregate implication is that economies with a large proportion of older households will be net international creditors.

D. Demographic Data

In the model, households are assumed to be formed by two individuals of age 21. The household then lives for a period of 60 years at which time the the last adult member dies. Clearly, much demographic detail is lost in this representation of the household life cycle, including intergenerational and international differences in life expectancy, age at marriage, and divorce

rates. But the model does allow me to recognize historical variations in the size of successive birth cohorts.

To measure the number of households formed in a given country in year t, I divide by two the number of individuals who were of age 37 and residing in the country during year (t+16). Individuals are counted in their late thirties as a crude adjustment for immigration.[9] Population projections used in the calculations were drawn from the following sources: Germany (Federal Republic), European Community, Office for Official Publications; Japan, Institute of Population Problems (1982); United Kingdom, European Community, Office for Official Publications; and the United States, U.S. Bureau of the Census (1984).

II. Demographics and U.S. Net Capital Flows during the 1970s and 1980s

A. Simulation Results

The deterioration in U.S. net foreign assets was most evident during the 1980s. However, given the prevalence of capital controls, pressure for the United States to import capital may well have been present in earlier years. To evaluate the role of demographics in the evolution of U.S. foreign indebtedness, I consider an intervening period--the year 1980--and ask what the allocation of world capital would have looked like in that year had capital flows been unobstructed. To simplify the calculations, I assume that the factor prices that clear the world capital market in 1980 also prevailed in all previous years and were expected to prevail in all future years.

An equilibrium was determined numerically. For any particular interest rate, there is a unique wage that ensures zero economic profits. Given these

prices, household wealth can be computed using the life-cycle model. Aggregate wealth is then the sum of individual household wealth. Given factor prices, there is a single ratio of capital to labor that minimizes costs in all countries. An aggregate demand for capital can then be computed by multiplying this ratio by the world labor supply. Using iterative methods, an interest rate and wage can be found that equate aggregate wealth at the beginning of 1980 to the world capital requirement for that year.

The market-clearing interest rate proved to be .05.[10] At that interest rate, U.S. net foreign assets were -8 percent of (simulated) U.S. GNP. Table 1 provides an illustrative summary of the calculations. Because factor prices are common across countries and constant over time, the wealth position of any household, regardless of its nationality or vintage, can be determined from a single age-wealth profile. National wealth per household is calculated by multiplying wealth at each age by the fraction of the household population of that age and then summing over all ages. Aggregate domestic capital per household is computed in a similar way using an age-capital profile. Net external assets per household are a weighted average of the difference between household wealth and required capital at each age.

The calculations in Table 1 show clearly how international differences in age distribution in 1980 were sufficient to produce a substantial deficit in the U.S. net foreign investment position. Relative to the collective populations of Japan, West Germany, and the United Kingdom, the United States had a large proportion of households in the age group 21-30 and a small proportion in the group aged 41-50. Because the gap between required capital and personal wealth declines steadily with age, these differences in population age mix yield strong predictions about which countries would be net

recipients of capital in an efficient market. For a broad range of parameter values, the United States proves to be a significant net borrower of international capital.[11]

Using the factor prices that cleared the international capital market in 1980, I also computed a hypothetical time path of changes in the stock of U.S. net foreign assets for each year from 1970-1989. The calculated flows allow us to gauge the pressure for the United States to import capital during the 1970s and to see how demographic factors may have affected U.S. foreign indebtedness during the 1980s.[12] The results are shown in Table 2. Demographic forces were sufficient to produce a substantial U.S. current account deficit throughout both decades. The calculated inflows range from a little less than 1 percent of U.S. GNP in the early 1970s, to a high of 2 percent of GNP during the early 1980s, and then back down to ½ of one percent of GNP by the late 1980s.

The simulated movements in U.S. foreign indebtedness can be explained in terms of the shifting age mix of the U.S. household population. As shown in Figure 2, the share of the population accounted for by households in the age group 21-40 increased steadily throughout the 1970s and 1980s. This, of course, reflected the entry of the baby-boom generation into the adult population. Offsetting the rise in the frequency of young households was a decline in the share of households aged 41-60. The fall in the share of this group was associated, in part, with the aging of the baby-bust generation born during the 1930s. Because the difference required capital and personal wealth is larger for households aged 21-40 than it is for households aged 41-60, these shifts in age mix had the inexorable effect of raising U.S. foreign indebtedness.

To further understand the role of demographics in the buildup of U.S. foreign liabilities, it is useful to express net capital outflows as the difference between national saving (change in wealth) and domestic investment (change in capital). The results of this decomposition are shown in Table 2. Most of the simulated movement in capital inflows during the 1970s and 1980s is seen to be the result of changes in the rate of domestic investment. While the entry of the baby boom into the adult population does place some downward pressure on the aggregate savings rate, its most important effect is to raise the rate of domestic investment.

B. Evaluating the Simulations

How seriously should we take the simulation results? One way of judging them is by the reasonableness of the model from which they are derived. The principal weakness of the analysis would appear to involve the use of the life-cycle theory as a means of describing household savings behavior. As is well known, the life-cycle theory substantially overstates the rate of wealth decumulation during retirement. The simulation results may then be distorted if there are significant international or intertemporal differences in the frequency of elderly and retired individuals in the adult population. The results for the period 1970-1989 should not suffer from this distortion, however, as they are driven by differences between the population shares of the young or middle-aged, not the elderly.

Another way of evaluating the simulations is to compare the calculated movements in each of the model's variables with actual movements in those variables. Figure 3 shows the simulated and measured values for U.S. net capital outflows during the period 1970-1989. The simulated flows do not

match well with measured flows. There were, however, factors other than demography that had an important effect on capital flows during this period, including government regulations that restricted capital outflows from Japan and other major countries during the 1970s and rapid growth in the U.S. federal budget deficit during the 1980s. It seems clear that the data on capital flows could easily be explained by a confluence of different forces, with demography being one of them.

We can also break down capital outflows into aggregate saving and investment and see how well the simulated movements in these variables explain their actual movements. According to the simulations, shifts in the age mix of the U.S. population served to reduce the aggregate saving rate during the 1970s and 1980s, but not by very much--something on the order of ¾ of a percentage point of GNP. Similar results have been obtained by Lawrence Summers and Chris Carroll (1987).[13] Measures of actual saving, on the other hand, show a much larger decline in the private savings rate--between 1½ and 2½ percentage points.[14] Demography cannot account for this much of a decline in private saving. If other factors were involved, then they too become part of the explanation for the rise in U.S. foreign indebtedness.[15]

Recent trends in U.S. demographics should also have had an important effect on the rate of domestic investment, raising it by perhaps a full percentage point of GNP during the 1970s and then reducing it by as much 2 percentage points of GNP during the 1980s. Are these movements evident in the data? Some measures of investment fit the simulation scenario very well, such as the series on cyclically-adjusted real business fixed investment reported by John Tatom (1989, Figure 5, p.11). Other measures, however, especially those that attempt to adjust for economic depreciation, indicate that

investment spending trended downward throughout the 1970s and 1980s.[16] Thus, the data provide no clear basis for evaluating the simulations. It does seem likely, however, that the rapid growth of the U.S. labor force during the 1970s and early 1980s raised the rate of U.S. capital formation. This is the essential message of the simulations.

In summary, demography falls well short of offering a complete explanation for the recent surge in U.S. foreign indebtedness. Undoubtedly, many factors were involved. But the size and robustness of the simulation results give strong indication that demography played an important role. By implication, much of the recent indebtedness of the United States may simply represent an intertemporal exchange of goods with other countries in the world. To that extent, future living standards in the United States have not been jeopardized as greatly as the raw statistics indicate.

III. Projected U.S. Net Capital Flows, 1990-2009

Just as demographic forces were significant enough to shape the pattern of international investment during the 1980s, so are they likely to continue to affect the world economy in coming years. In this section I consider what future demographic changes will mean for capital flows during the 1990s and on into the next century.

A. Constant World Interest Rate

I begin by assuming that the factor prices that cleared world markets in 1980 remain constant for an indefinite period. Changes in U.S. net foreign assets then are driven solely by shifts in the age mix of the U.S. population. Figure 4 shows projected changes in the age distribution of U.S. households

from 1990 through 2009. The most notable movements in the distribution are the declining share of households aged 21-40 and the rising share of households in the age group 41-60. These movements, of course, are associated with the aging of the baby-boom generation. Because the gap between required capital and personal wealth declines with age, the shifts in age distribution imply that the U.S. economy will have a diminished need for foreign capital in future years.

Shown in Table 3 are the projected values for U.S. net capital outflows, national saving, and domestic investment over the period 1990-2009. The results are dramatic. As the population ages, savings as a fraction of GNP rises by 2 percentage points. With slower growth in the labor force, investment as a share of GNP falls by roughly 3 percentage points. Both the rise in saving and the decline in investment work toward moving the United States from being a net recipient of capital to being a net supplier of capital. The size of the swing is enormous. U.S. capital outflows move from around -1 percent of GNP in the early 1990s to more than 4 percent of GNP by the year 2009. It is important to keep in mind, however, that just as the demographically-induced inflows of the 1980s were no cause for alarm, so are the projected outflows no cause for celebration. The outflows simply reflect the efforts of a large generation preparing for its retirement.

B. Declining World Interest Rate

The projections reported in Table 3 were based on the assumption that the world interest rate and wage remain constant at their equilibrium values in 1980. During the decade of the eighties, there is insufficient movement in the age mix of the world population to warrant any substantial price

adjustment. Indeed, the percentage discrepancy between world wealth and world capital demand is never any greater than 1 percent, and by 1989 it is nearly zero. Over the next two decades, however, demographic shifts within the industrialized world generate a growing excess of capital supply over capital demand, an excess which reaches 10 percent of world wealth by the year 2009.[17] Interest rates need not change if new investment opportunities can be located outside the industrialized world, say in Third-World or newly-democratized countries. If not, rates must fall to clear the world capital market.

Figure 5 illustrates how different the path of capital flows could be depending on the future course of interest rates. The solid lines show projected net capital outflows for the United States and the three other OECD countries under the assumption that factor prices remain at 1980 levels. In the absence of an interest rate adjustment, each of the countries tries to run a current account surplus over most of the twenty-year period. The dashed lines in the chart show what capital flows would look like if interest rates adjust to equalize flows within the industrialized world.[18] By stimulating domestic investment, the drop in interest rates reduces capital outflows for each country. The United States, in particular, continues to add to its stock of foreign indebtedness throughout the 1990s and on into the next century.

IV. Conclusions

In this paper I have combined detailed demographic information with conventional economic models of wealth and capital accumulation in an effort to determine the extent to which demographic conditions in the industrialized countries may have contributed to the recent growth in U.S. foreign indebtedness. The results indicate that demographic forces alone were

sufficient to generate a significant flow of foreign capital to the United States. The simulated inflows are on the order of 1 to 2 percent of GNP per year for most of the 1970s and 1980s. For the sake of comparison, peak inflows during this period were about 3 percent of GNP. No single factor can explain the growth in U.S. foreign indebtedness. But the simulation results are sufficiently strong to suggest that demography played an important role.

Shifts in the age structure of the U.S. population that are projected to occur over the next two decades have the potential to raise U.S. net capital outflows by as much as 5 percentage points of GNP. At the same time, however, demographic conditions in other major industrialized countries will encourage their export of capital. To avoid a savings glut, new investment opportunities may have to be found in other parts of the world. If these investments are not forthcoming, the United States is likely to remain a debtor country for many years to come. More importantly, a large generation of its citizens may earn low returns on its wealth and be that much less well prepared for old age and retirement.

Footnotes

[1] Official statistics overstate U.S. net foreign indebtedness. This occurs because direct investment is valued at book prices rather than market prices, and U.S. direct investment abroad generally predates foreign acquisition of U.S. assets (see Michael Ulan and William Dewald (1989)). Despite the error in official measures, it is widely agreed that the United States is presently a net debtor and that U.S. foreign indebtedness is growing at a rapid pace.

[2] Using data on forward exchange rates and covered interest differentials, Jeffrey Frankel (1989) finds evidence of substantial barriers to international capital flows during the 1970s. A liberalization of capital controls by Japan and other major countries during the late 1970s and early 1980s, however, resulted in a narrowing of covered interest differentials. Frankel concludes that the deregulation of capital markets was likely to have been an important factor behind the massive flow of capital to the United States. After examining the correlation in movements in consumption spending in OECD countries, Evan Koenig (1989) also concludes that capital markets were more integrated in the 1980s than they had been in the previous decade. For an historical account of recent changes in capital controls, see Frankel and his references.

[3] Simulation methods have also been used by Alan Auerbach and Laurence Kotlikoff (1987) in their study of the effect of changes in fertility rates on the U.S. social security system. A similar analysis is carried out by Auerbach, et al. (1989) for the United States, Japan, West Germany, and Sweden. Simulation methods are often used to study the economic consequences

of demographic changes because aggregate time series data do not contain enough information to econometrically identify the effects of gradual shifts in the age structure of a population on macroeconomic aggregates. An apparent exception is housing prices, which Gregory Mankiw and David Weil (1989) find to be statistically related to the age mix of the population.

[4] The consumption weights by age group are as follows: (0-5, .25), (6-15, .33), (16-20, .50), (21-65, 1.0), (> 65, .75). For a discussion of the estimation and use of adult equivalence scales, see A. Deaton and J. Muellbauer (1980, pp. 191-213).

[5] See Paul Glick (1977) for statistics on the fertility patterns of U.S. women during the twentieth century.

[6] More precisely, the interest rate is adjusted to clear the capital market. The wage rate is determined along a factor-price frontier which requires that profits be zero in a competitive equilibrium.

[7] A low rate of wealth decumulation can be explained either by longevity and medical risk in the face of imperfect annuity markets or by a shift in preferences late in life with the household acquiring more of a taste for bequests. The evidence seems to favor the first explanation. The motive to transfer wealth at death does not appear strong. The rate of decumulation among the elderly is not significantly affected by the presence or number of children, and estate data show that bequeathed wealth is shared equally by children, which is inconsistent with some models of intergenerational altruism.

[8] The participation rates by age group are as follows. For the male: (21-55, 1.0), (56-60, .85), (61-65, .70), (> 65, 0). For the female: (21-26, .8), (27-34, .6), (35-39, .7), (40-55, .8), (56-60, .65), (61-65, .5),(>

65, 0).

[9] In the United States, for example, the number of residents aged 20-24 in 1970 was 3.5 percent less than the number aged 30-34 in 1980.

[10] Being dependent on units of measurement, the particular solution for the equilibrium wage is uninteresting.

[11] A sensitivity analysis was conducted by varying σ from .1 to .5, δ from 0 to .04, and α from .2 to .4. The simulated value of U.S. net foreign assets in 1980 ranged from -3 percent to -16 percent of GNP. The ratio of net foreign assets to GNP varied directly with δ and inversely with σ and α.

[12] As an alternative case, I allowed the interest rate and wage to adjust to clear the world capital market in each year after 1980. Little price adjustment was required, however, and the projected path of U.S. capital outflows was very similar to the one reported in Table 2. As I indicate in section III, shifts in the age mix of the world population do become significant during the 1990s and early 2000s, and the future course of U.S. indebtedness can be significantly affected by demographically-induced movements in interest rates.

[13] Summers and Carroll calculate the effect of demographic shifts on aggregate saving by combining age-specific saving rates available in cross-section data with time series data on the age distribution of income.

[14] According to the Commerce Department, U.S. net private saving as a fraction of net national product fell from an average of 8.9 percent during the 1960s to an average of 6.3 percent during the 1980s. Official statistics are known to suffer from serious measurement problems, however [see, for example, the article by Alan Auerbach (1985)]. An alternative measure by Patric Hendershott and Joe Peek (1987, Table 4, p.22), which adjusts for the

inflation premium in investment income and the savings component of social security contributions and expenditures on consumer durables, shows that the private savings rate fell by only 1½ percentage points over the period.

[15] Michael Boskin and Lawrence Lau (1988) offer one explanation for the decline in private saving. They find that individuals born before 1939 (i.e., experienced the Great Depression) consume a smaller percentage of their wealth at every age than do those born after them. The aging and gradual death of the more thrifty generation serves to reduce the aggregate saving rate. It is unclear, however, whether this change in savings behavior represents a shift in preferences for consumption over time or a reduced demand for precautionary saving.

[16] For a discussion of the recent behavior of U.S. investment spending, see John Tatom (1989) and Steven Englander and Charles Steindel (1989).

[17] The size of the surplus is probably understated in my analysis. For some OECD countries, e.g. Japan and West Germany, the share of the elderly is projected to rise significantly throughout the 1990s and 2000s. Given that the simulation model overstates the rate of dissaving among the elderly, the potential savings overhang is likely to be even larger than my analysis suggests.

[18] In the calculations, households are assumed to be myopic in their expectations about future interest rates and wages.

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Figure 1
Life-Cycle Profile of Household Wealth
and Required Capital

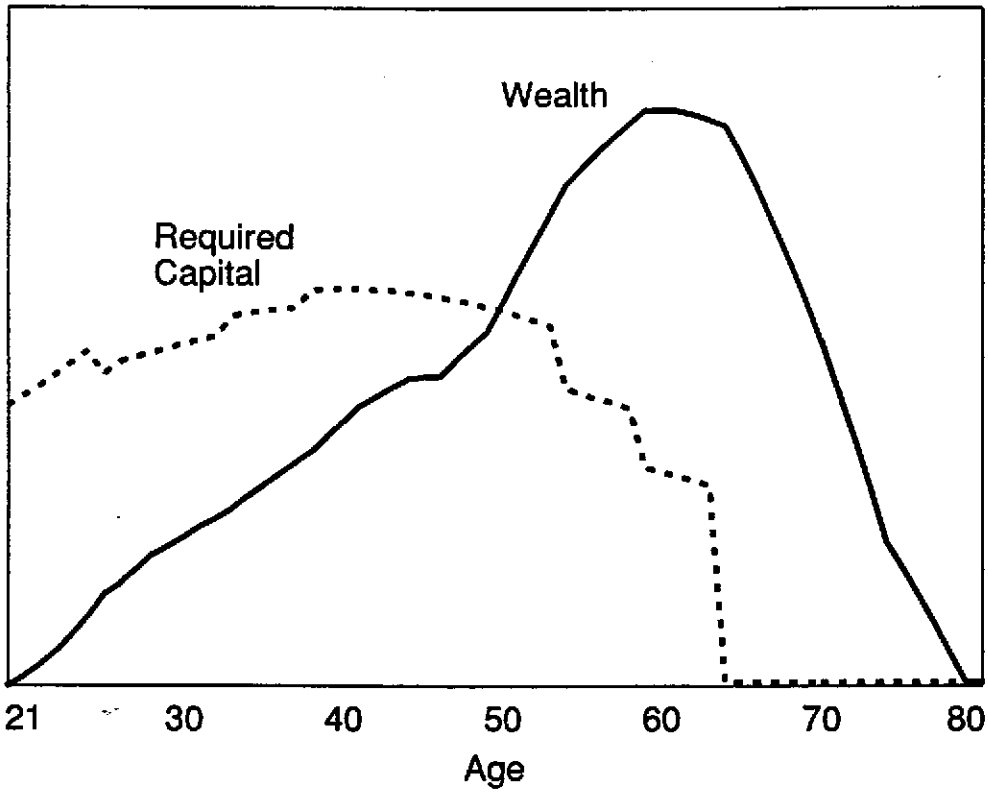
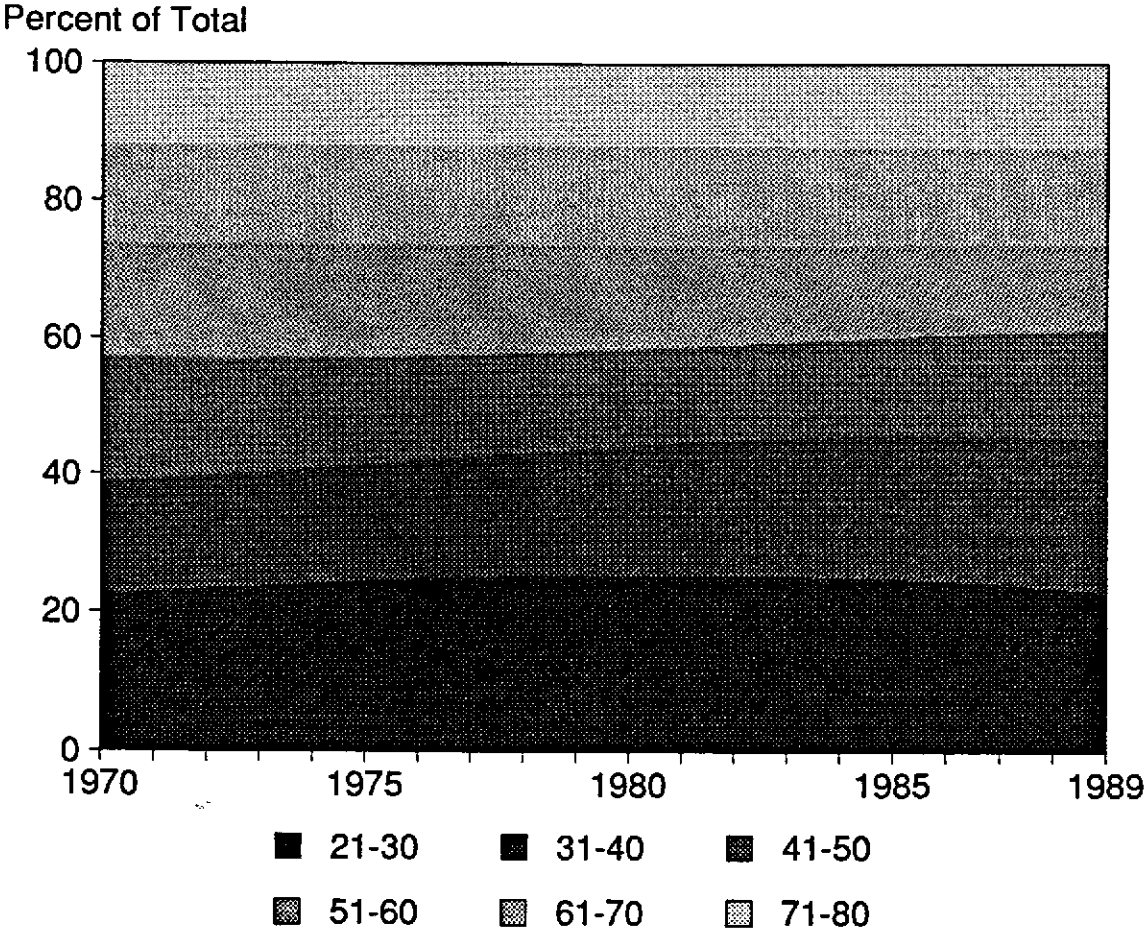


Figure 2
Age Distribution of U.S. Households, 1970-1989



NOTE: Data are based on a stylized representation of household formation and dissolution. See section in the text on demographic data.

Figure 3
Actual and Simulated U.S. Net Capital Flows

Percent of GNP

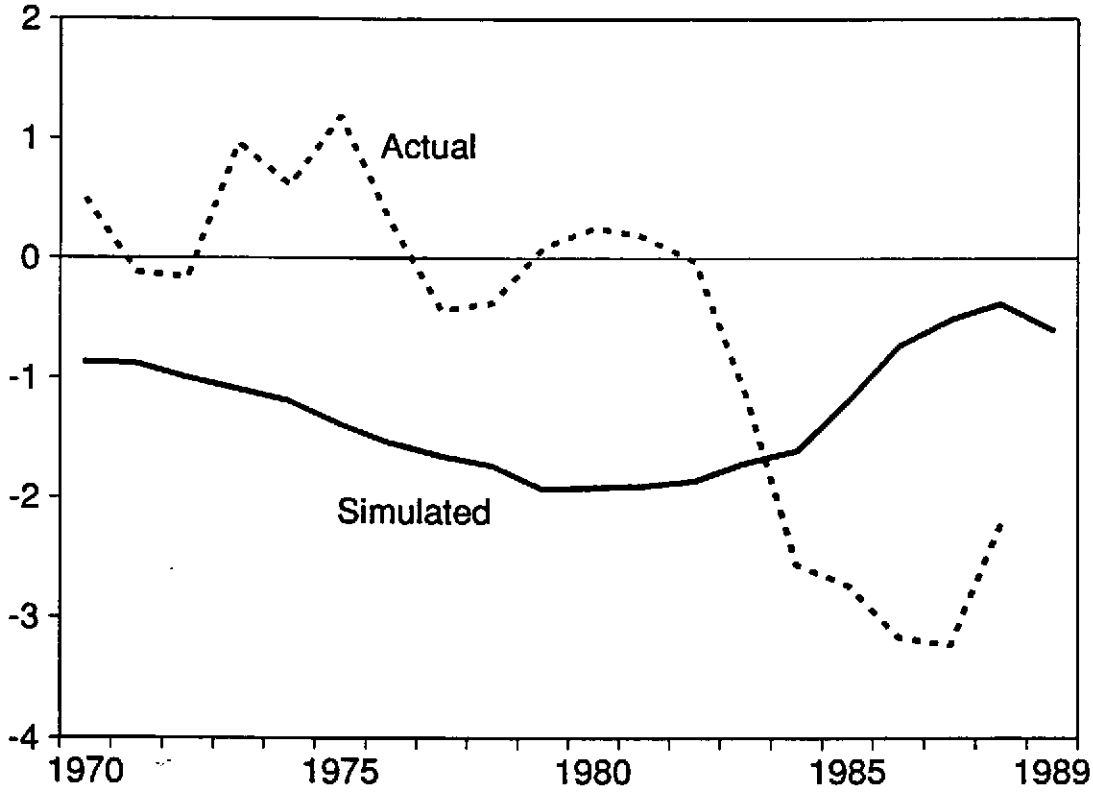
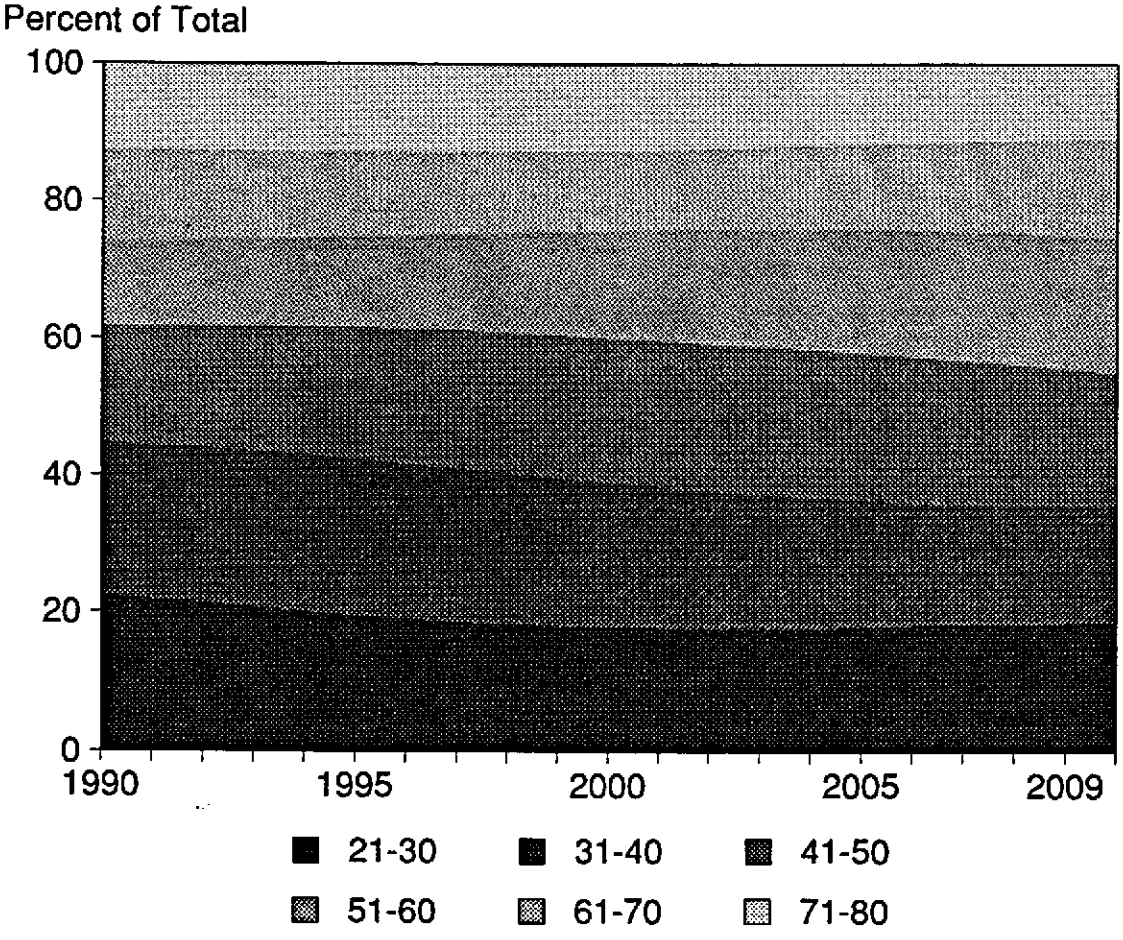
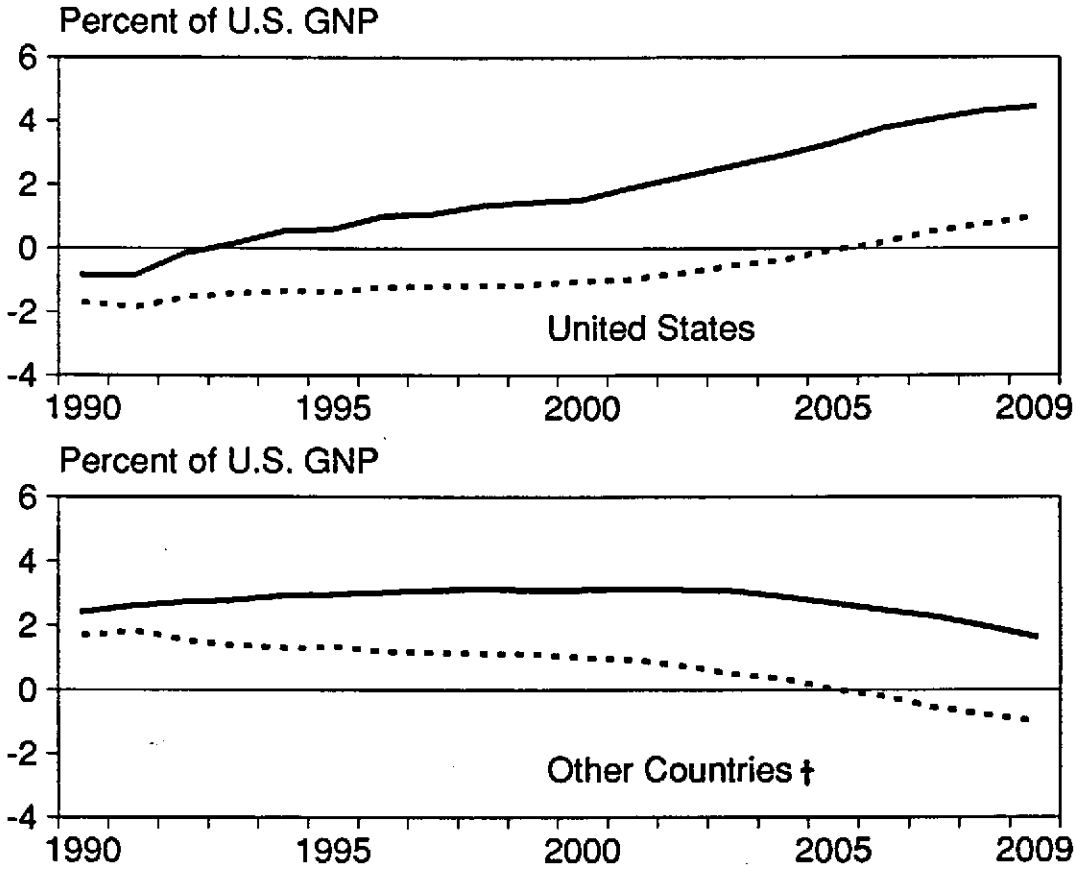


Figure 4
Age Distribution of U.S. Households, 1990-2009



NOTE: Data are based on a stylized representation of household formation and dissolution. See section in the text on demographic data.

Figure 5
Projected Net Capital Flows for Selected Industrialized Countries: Constant vs Declining World Interest Rate



†Japan, West Germany, and the United Kingdom, collectively.

Table 1

EQUILIBRIUM ALLOCATION OF WORLD CAPITAL IN 1980:
HYPOTHETICAL CALCULATIONS BASED ON COMPARATIVE DEMOGRAPHICS

United States

$$NFA = (.256)(-3.62) + (.190)(-2.57) + (.141)(-1.36) + (.152)(2.07) + (.142)(6.18) + (.119)(2.78) = \underline{-.084}\dagger$$

Other Countries‡

$$NFA = (.194)(-3.62) + (.199)(-2.57) + (.180)(-1.36) + (.158)(2.07) + (.137)(6.18) + (.132)(2.78) = \underline{.082}\dagger$$

Key: Net foreign assets (NFA) are calculated as $\Sigma\, s_i(a_i - k_i)$, where s_i is the share of the population accounted for by households in age bracket i, a_i is the average wealth of a household in bracket i, and k_i is the average capital required to support the labor supply of a household in bracket i. Age brackets are by ten-year age group, beginning with 21-30 and ending with 71-80. Household wealth and required capital are expressed as a percent of U.S. GNP per household.

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†Do not agree because of a small difference in population size.

‡Japan, West Germany, and the United Kingdom, collectively.

Table 2

SIMULATED RATES OF U.S. SAVING, INVESTMENT, AND CAPITAL OUTFLOW, 1970-1989
(Percent of GNP)

Year	National Saving	Domestic Investment	Capital Outflow
1970	4.78	5.65	-0.87
1971	4.80	5.68	-0.88
1972	4.82	5.81	-0.99
1973	4.83	5.93	-1.10
1974	4.84	6.03	-1.19
1975	4.83	6.21	-1.38
1976	4.81	6.36	-1.55
1977	4.79	6.43	-1.64
1978	4.74	6.48	-1.74
1979	4.68	6.60	-1.92
1980	4.63	6.55	-1.92
1981	4.58	6.48	-1.90
1982	4.51	6.37	-1.86
1983	4.43	6.13	-1.70
1984	4.34	5.94	-1.60
1985	4.26	5.46	-1.20
1986	4.17	4.90	-0.73
1987	4.08	4.60	-0.52
1988	4.00	4.37	-0.37
1989	3.93	4.52	-0.59

Table 3

PROJECTED RATES OF U.S. SAVING, INVESTMENT, AND CAPITAL OUTFLOW, 1990-2009
(Percent of GNP)

Year	National Saving	Domestic Investment	Capital Outflow
1990	3.88	4.70	-0.82
1991	3.85	4.73	-0.88
1992	3.86	4.02	-0.16
1993	3.91	3.75	0.16
1994	4.00	3.45	0.55
1995	4.10	3.48	0.62
1996	4.25	3.23	1.02
1997	4.41	3.32	1.09
1998	4.58	3.23	1.35
1999	4.77	3.32	1.45
2000	4.99	3.46	1.53
2001	5.20	3.27	1.93
2002	5.39	3.14	2.25
2003	5.58	2.97	2.61
2004	5.74	2.81	2.93
2005	5.88	2.57	3.31
2006	5.99	2.23	3.76
2007	6.03	1.98	4.05
2008	6.03	1.73	4.30
2009	5.98	1.53	4.45

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